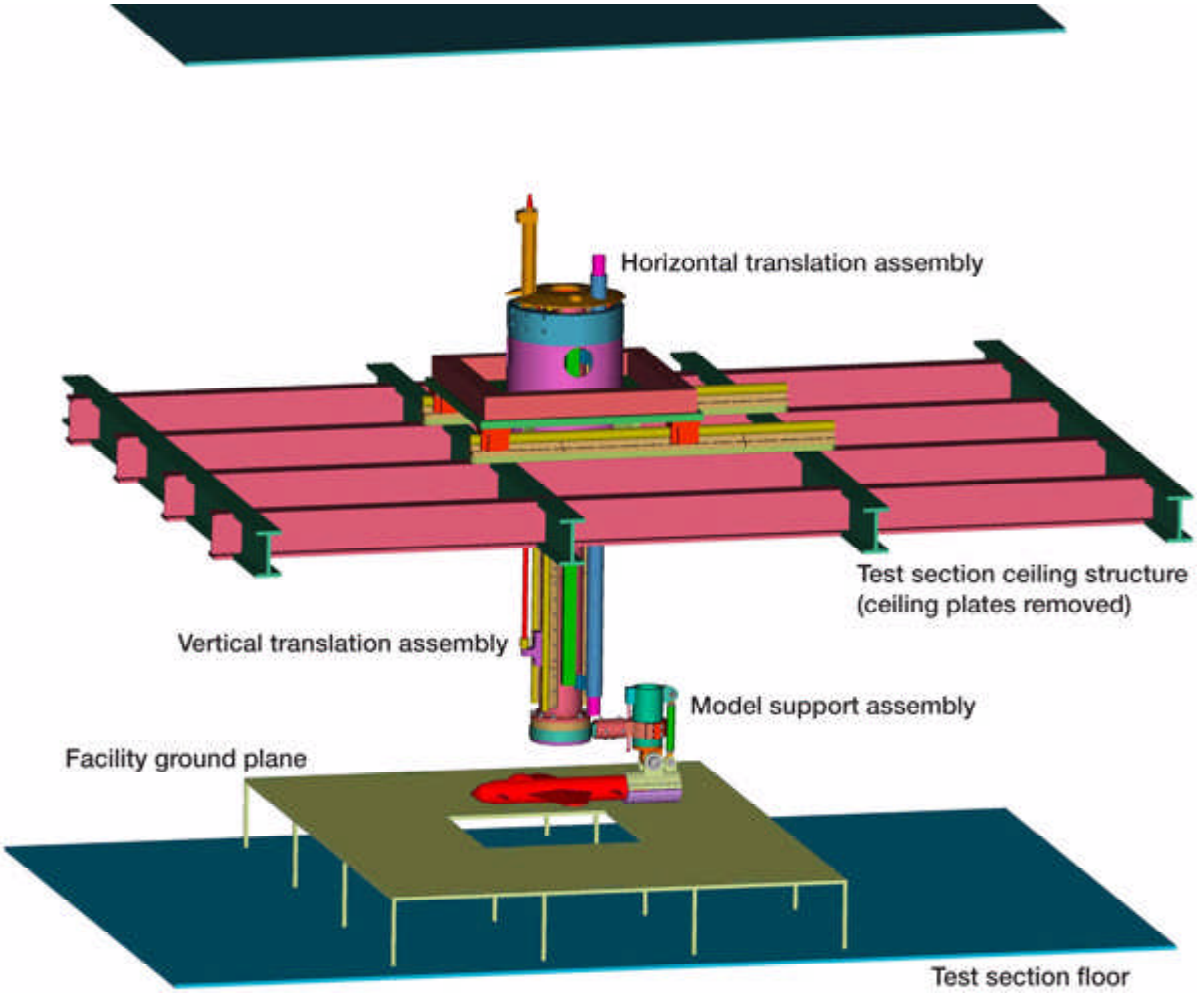
Short Takeoff and Vertical Landing Capability Upgraded in NASA Glenn's 9- by 15-Foot Low-Speed Wind Tunnel



Dynamic actuation system in the 9×15 LSWT test section with the facility ground plane installed.

Long description of figure Elevation view of the 9- by 15-Foot Low-Speed Wind Tunnel test section with the dynamic actuation system and facility ground plane installed. The test section ceiling plates have been removed to show the horizontal translation assembly secured to the ceiling structure with the vertical translation assembly secured to the horizontal translation assembly. A generic STOVL model is shown positioned above the trap door in the facility ground plane. Hot air piping has been removed for clarity.

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The NASA Glenn Research Center supports short takeoff and vertical landing (STOVL) tests in its 9- by 15-Foot Low Speed Wind Tunnel (9×15 LSWT). As part of a facility

capability upgrade, a dynamic actuation system (DAS) was fabricated to enhance the STOVL testing capabilities. The DAS serves as the mechanical interface between the 9×15 LSWT test section structure and the STOVL model to be tested. It provides vertical and horizontal translation of the model in the test section and maintains the model attitude (pitch, yaw, and roll) during translation. It also integrates a piping system to supply the model with exhaust and hot air to simulate the inlet suction and nozzle exhausts, respectively. Hot gas ingestion studies have been performed with the facility ground plane installed.

The DAS provides vertical (ascent and descent) translation speeds of up to 48 in./s and horizontal translation speeds of up to 12 in./s. Model pitch variations of ±7°, roll variations of ±5°, and yaw variations of 0° to 180° can be accommodated and are maintained within 0.25° throughout the translation profile. The hot air supply, generated by the facility heaters and regulated by control valves, provides three separate temperature zones to the model for STOVL and hot gas ingestion testing. Channels along the supertube provide instrumentation paths from the model to the facility data system for data collection purposes.

The DAS is supported by the 9×15 LSWT test section ceiling structure. A carriage that rides on two linear rails provides for horizontal translation of the system along the test section longitudinal axis. A vertical translation assembly, consisting of a cage and supertube, is secured to the carriage. The supertube traverses vertically through the cage on a set of linear rails. Both translation axes are hydraulically actuated and provide position and velocity profile control. The lower flange on the supertube serves as the model interface to the DAS. The supertube also serves as the exhaust path to the model and supports the hot air piping on its external surfaces.

The DAS is currently being assembled at the 9×15 LSWT facility. Following assembly and installation, a series of checkouts will be performed to confirm the operation of the system.

Find out more about this research:
Glenn's Research Testing Division http://www.grc.nasa.gov/WWW/RTD/
Glenn's Facilities Portal http://facilities.grc.nasa.gov/.

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